CRES®
CENTER FOR REPRODUCTION OF ENDANGERED SPECIES
REPORT
SUMMER 1999

Assisted Drill Reproduction: Problems and Solutions

Drills are the second largest of the monkey species, and they are also at the top of the list for conservation action: fewer than 3,000 remain in the wild. In their equatorial rain forest home that ranges from southeastern Nigeria to western Cameroon, there has been political turmoil, which in turn affects the habitat and any efforts at species management. The drill baboon also happens to be a deep forest species, making census taking difficult, and they are wary of people. However, in a captive environment, drills—especially males—imprint on human caretakers, which prevents the normal social development needed to become a good mate and parent. These factors have hampered studies in the wild and led to poor reproduction in captivity.

Faced with an aging drill population at the San Diego Zoo, we are working with our small group to see if we can boost the dwindling reproduction rate. Our multidisciplinary team involves the Zoo's mammal curatorial, behavior management, and veterinary services departments; the CRES behavior, reproductive physiology, and endocrinology divisions; and Dr. David Smotrich, a human reproductive endocrinologist. The team's objective is to facilitate breeding in drills using modern reproductive enhancements.

There are two drill males in our group: Ace, at 24 years, is probably

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J. Simerson

At 14 years old, Pearl, a mandrill baboon, has successfully raised four offspring. She has been chosen as the recipient of eggs and sperm from the drills, because mandrills have a better history of reproduction in captivity.

CRES® is operated by the Zoological Society of San Diego.

Focus on Slow Lorises
Herpesvirus studies now under way at CRES.
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Birds at the Zoo and Wild Animal Park
Antiparasite drugs linked to toxicity.
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Save the date for Celebration for the Critters.
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Assisted Drill Reproduction: Problems and Solutions

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the oldest male drill in existence, while Loon, at 19 years, is a diabetic that has never bred. Among the female drills, Rosie is 22 years old and has not bred since 1984, while Opal is 19 years old and was injured by her parents. The mandrill baboons are on loan from the Tulsa Zoo in Oklahoma: Pearl is 14 years old and has raised four offspring successfully, and Angie, 8 years old, is the successful mother of 7-year-old Pandora. Because mandrills reproduce well in captivity, the decision was made to use the mandrill females as surrogate mothers, recipients of drill eggs and semen. Also, Pearl and Angie are known to be successful mothers and will most likely hand raise their offspring, which is another positive factor.

Our team considered two relatively simple strategies that would promote drill reproduction. The first is artificial insemination (AI), which places semen into the female reproductive tract at the ideal point during the menstrual cycle at the time of ovulation in order for fertilization to occur. This is the simplest of the reproductive enhancement procedures and was used with Opal.

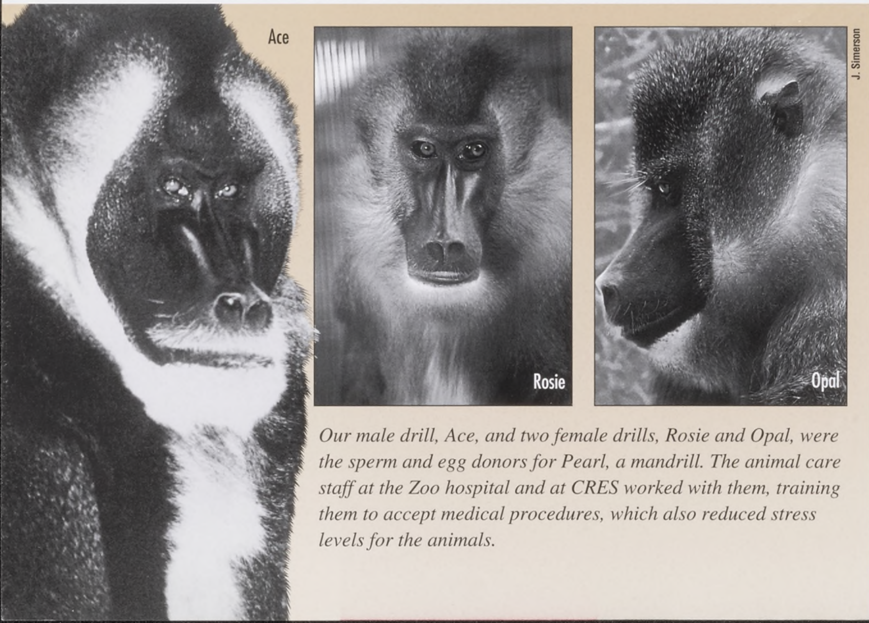
The second procedure, known as gamete intrafallopian transfer (GIFT), was used with Pearl as the recipient. This involves suppressing the natural cycle of both donor and recipient animals using two hormones essential for the female reproductive tract. With the natural cycle now suppressed, the donors are treated with elevated doses of follicle stimulating hormone (FSH) and luteinizing hormone (LH). This stimulates multiple follicles to develop simultaneously, which is known as superovulation. At the same time, the uterus of each recipient is prepared to receive eggs and sperm through daily doses of estrogen and progesterone. With donors and recipients synchronized, the eggs are harvested and mixed with fresh sperm before being placed in the oviducts of the recipients for natural fertilization to occur.

A member of the Zoo's hospital staff mixes harvested eggs and sperm from drill donors before implanting them into a mandrill recipient.

Our goal as a team has been to train the drills and mandrills to voluntarily cooperate with monitoring and with medical procedures, such as semen and urine collections, blood draws, receiving injections, and ultrasound. Through operant conditioning, the animals learned quickly and became comfortable with the animal care staff, which reduced stress.

The Zoological Society's drill A.R.T. team, or Assisted Reproductive Technology, hopes that the GIFT attempt in May 1999 will result in the pregnancy and birth of a drill baboon, with ultrasound helping to pinpoint pregnancy before any visible signs appear. But even without a confirmed pregnancy, our team can now provide useful reproductive information for other endangered primate species. It is another step forward in adding to the dwindling worldwide population of drills.

—Patrick J. Morris, D.V.M., Dipl., A.C.Z.M., Senior Veterinarian/San Diego Zoo



Our male drill, Ace, and two female drills, Rosie and Opal, were the sperm and egg donors for Pearl, a mandrill. The animal care staff at the Zoo hospital and at CRES worked with them, training them to accept medical procedures, which also reduced stress levels for the animals.

Virology/Immunology

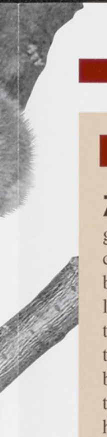
Many of the animals within the Zoological Society's collection or their immediate ancestors are wild caught. With them, they often bring latent or silent infections from pathogenic organisms. Scientists in this CRES division have determined the DNA sequence of a small region of a herpesvirus found in captive slow lorises, most of which were wild caught in Southeast Asia. When compared to DNA sequences from the same region of other primate herpesviruses—including human DNA—the slow loris virus is not most closely related to other Asian primate viruses, as one might expect, but to human herpesvirus 6, or HHV6. We know HHV6 infects blood lymphocytes and is associated with diseases in human adults that are similar to those diseases seen in virus-positive slow lorises.

These studies not only strengthen the possibility that the slow loris virus is responsible for the symptoms seen in that species, they also provide some insight into the evolution of a group of viruses found in species at the opposite ends of the phylogenetic tree of primates. These findings also aid CRES scientists in determining the long-term impact of the virus on the slow loris colony.

Pathology

For some time, CRES pathologists have suspected that several antiparasite drugs widely used in zoos—and widely thought to be among the safest drugs available for zoo animals—were actually toxic to some species of birds. In order to provide convincing proof of these suspected toxicity problems, summer student extern Lauren Howard, from the Virginia-Maryland Regional College of Veterinary Medicine, conducted a retrospective epidemiologic investigation of the association between use of these drugs and toxic side effects in birds from the Zoo and the Wild Animal Park. Her study confirmed what pathologists had long suspected: there is high risk of serious side effects when these drugs are used in certain bird species. These findings will not only improve the safety and efficacy of health care for our animals but also for zoo animals throughout the world.

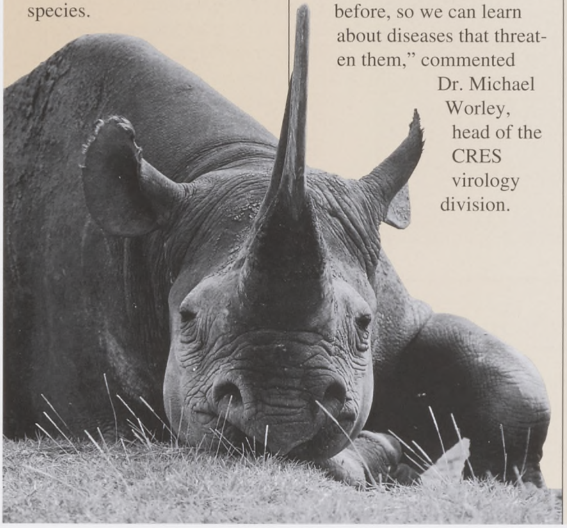
Because of the quality and impact of Lauren's study, she received the first place award in the American Association of Zoo Veterinarians Student Manuscript Competition for 1999. Lauren's work demonstrates how CRES student externships are equipping young investigators to be future leaders in the fields of conservation medicine and research. Our congratulations go to Lauren!

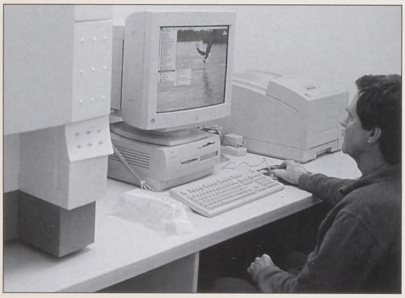


New Technology Comes to CRES Team

Zoogoers are familiar with giant pandas, black rhinoceroses, cheetahs, and koalas, but there is still much to be learned about the biology of their immune systems. Earlier this year, scientists at CRES became the first zoo research team in the United States to have the FASCalibur™ flow cytometer system, which will be used for in-depth studies of blood and immune systems of threatened and endangered species.

This equipment was made possible through support and donations from **Becton Dickinson**, the manufacturer of the equipment, and the **Pacific Bell Foundation**, a major supporter of the Zoological Society of San Diego's giant panda research project. "The new flow cytometer is a powerful tool that will allow us to analyze immune systems of animals in more detail than ever before, so we can learn about diseases that threaten them," commented Dr. Michael Worley, head of the CRES virology division.





"In addition, it will help the San Diego Zoo's and the Wild Animal Park's veterinarians get a more precise picture of their patients' blood work." The flow cytometer will also be used by other divisions within CRES, including reproductive physiology, molecular genetics, and pathology.

The CRES team is concerned with advancing the health care for critically endangered animals. Because little is known about the immune systems of rhinos, for example, equipment like the flow cytometer will allow scientists to offer diagnosis and prognosis of various dysfunctions of the immune system that may lead to therapy for the diseases that affect this species, as well as track and follow the therapy.

Some of these studies will be done in collaboration with the University of California at Davis, which reflects the CRES goal to educate zoo veterinarians, wildlife biologists, and the general public about the application of science to conservation efforts, as well as share technology with visiting scientists and train graduate students from local universities. Dr. Worley believes that "this is a major advance for both the Zoological Society and its interaction with UC Davis. I have been dreaming of this for six years and now it is a reality. Our staff at CRES considers our involvement with students and fellow scientists as one of our most important contributions to conservation and science."

Cans for Critters Conserves at Earth Fair '99

What do you do with empty aluminum cans, a large recycling dome, three very chubby mascots, and toe-tapping **Z90** music? You put them all together with Zoo volunteers and staff and get Cans for Critters at Earth Day on April 18, 1999!

With over 50,000 participants flooding Balboa Park on Sunday, the Cans for Critters program handed out prizes for recycled cans. Bamboo Bear, Sydney Koala, and Matilda Koala danced to the music and greeted all recyclers who were there helping to make the Earth a cleaner place for all of us.

Domino's Pizza supported Cans for Critters by donating all pizza proceeds from Earth Day to CRES. In the past 19 years, the Cans for Critters program has raised more than $280,000 to benefit the Center for Reproduction of Endangered Species.

Remember—every day is Earth Day! You can bring your aluminum cans and glass bottles to the animal-print domes located on the south side of the Zoo parking lot. All proceeds from the domes go to CRES, thanks to **Tayman Industries**.

A Commitment to Global Conservation:
1999 Zoological Society of San Diego's Conservation Medalist

Okapis are just one of the many species that have interested Dr. George Rabb over the past 40 years. As director of Chicago's Brookfield Zoo since 1976, he has been a leader in the conservation field, working to present strategies and policies that take into account complex social and economic factors as part of the solution.

On April 30, Dr. Rabb received the Zoological Society of San Diego's Conservation Medal for 1999, and he gave an inspiring presentation that explained the present role of zoos. He showed that they have come a long way from being "living natural history collections or menageries" to today's "environmental and educational centers." Zoos now work to convey appreciation of ecosystems and the survival of species, emphasizing the importance of biological diversity. George Rabb has been called one of the first true conservationists, and the Society is honored to name him as its Conservation Medalist this year.

Consider Planning for the Future

If you would like to join CRES in the fight against extinction and include yourself among a generous group of supporters who have provided financial assistance to CRES, consider making a planned gift. Planned gifts come in many forms and can be designed to provide you with income for life, immediate tax deductions, a reduction in your estate tax liability, and avoidance of capital gains taxation, not to mention the knowledge that you are leaving an enduring legacy for generations to come.

Some of the most common planned gift devices are bequests in wills and trusts, life income fund contributions, Charitable Remainder Trusts, donations of life insurance policies, and life estate arrangements. Planned gifts provide important future capital for the CRES programs that are leading the way in wildlife conservation research, while often allowing you to maintain the use of your cash and assets during your lifetime. For instance, by naming the Zoological Society of San Diego's CRES as a beneficiary of a bequest in your will or trust, you make a future gift with no immediate cash out of pocket. And, of course, outright gifts of cash and appreciated securities are always welcome and sincerely appreciated!

For more information on how you can help CRES continue its important work, please contact Patrick O'Reiley at (619) 685-3215 or at P.O. Box 120551, San Diego, CA 92112. If you have already included us in your estate plan, we want to know! Please phone or write to us so that we may properly thank you and include you as a member of our prestigious Heritage Guild.

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Come for Cool Cats—Hot Nights!

Calling all "cool cats" to the San Diego Zoo's 19th Annual Celebration for the Critters on Saturday, September 25, from 7 P.M. to midnight! Cool Cats—Hot Nights will feature the sizzling rock-and-roll sounds of Art Deco and the New Era and other entertainment, plus tantalizing taste treats from many of San Diego's finest restaurants and beverage vendors.

Roaring revelers can prowl the party grounds of the San Diego Zoo, bid in the fabulous Silent Auction, and enter a drawing for spectacular prizes. This "hot" night boasts Skyfari rides, games, prize drawings, critter encounters, and more wild diversions than a cheetah has spots! Proceeds benefit the global conservation efforts of CRES, the Zoological Society's Center for Reproduction of Endangered Species—and last year's successful Celebration raised $185,000!

Tickets are on sale for $50 per person (or $60 after September 10), and special VIP packages include admission to a preview party at 6 P.M. Call (619) 231-1515, extension 4236, for the hottest tickets in town!

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SAN DIEGO ZOO · SAN DIEGO WILD ANIMAL PARK

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